

The heavy rains of the 25th and 26th over the Texas watershed caused rapid, dangerous, and destructive rises in the rivers of that State a few days later. General warnings were widely disseminated on the 26th. The report of this flood will appear in the *WEATHER REVIEW* for March, 1903.

During the month the River and Flood Service was extended to the Passaic River of New Jersey, with headquarters at Philadelphia, Pa., and the Hudson River service, Albany, N. Y., district, was greatly enlarged and improved.

Stations were established on the Passaic River and tributaries as follows: On the Passaic River at Chatham, N. J.; on the Rockaway River at Old Boonton, N. J.; on the Ramapo River at Mahwah, N. J., and on the Pompton River at Pompton Plains, N. J.

This service will be maintained with the cooperation of The Society for Establishing Useful Manufactures, Paterson, N. J., through its Chief Engineer, Mr. John H. Cooke. While the Passaic River is a comparatively small stream, its total drainage area being but 949 square miles, it is nevertheless an extremely important one on account of the great commercial interests located along its lower portion and dependent upon it for

power. The Passaic floods are sudden and at times dangerous and destructive to both commercial and agricultural interests, and it is hoped that the new service will be able to give timely and effective warnings of approaching flood waters.

For the benefit of the Hudson River service new stations were established as follows, all within the State of New York: On the Hudson River at Corinth, Glens Falls, Mechanicsville, Cohoes, Troy, Castleton, and Stuyvesant; on the Mohawk River at Utica, Little Falls, Fort Hunter, and Schenectady; on Schroon River at Warrensburg; on the Sacondaga River at Northville; on the Hoosick River at Hoosick Falls and Schaghticoke; on Schoharie Creek at Schoharie Junction and Millpoint, and on West Canada Creek at Trenton Falls.

The highest and lowest water, mean stage, and monthly range at 167 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By MR. JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions during February are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Excessively wet and unfavorable; very little farm work was done, though some corn and cotton land was prepared in southeast counties, where rainfall was least; floods in all large streams and much lowland inundated. Severe cold wave of 17–18th killed young oats, very early fruit, and nearly all early trucking crops; wheat and fall sown oats were slightly damaged. Fruit prospect doubtful, as recent damage by freeze can not be determined until later in the season.—*F. P. Chaffee.*

Arkansas.—Farming operations were delayed by continued unfavorable weather; the ground was too wet to plow and very little of this work was accomplished; some cotton remains unpicked and can not now be gathered. Early sown wheat and oats were in good condition generally, but it is believed that the late sown were injured by too much rain. Indications are that the entire peach crop was apparently destroyed by the cold snap; the buds were frozen and killed in almost every section, though reports were more favorable in some localities. Apples, pears, and small fruits were not injured.—*Edward B. Richards.*

Arizona.—The weather during the greater part of February was abnormally cold; the precipitation was generally in excess of the normal, but in some localities there was a deficiency; the greater part of the precipitation fell during the first decade. The supply of irrigation water was adequate and will be ample the rest of the season. Grain and alfalfa and the ranges generally were in good condition. Frozen ground has delayed seeding in some localities, and many peach and almond blossoms were killed by frost. Stock has suffered somewhat by severe weather in the colder portions of the Territory.—*M. E. Blystone.*

California.—Abnormally low temperatures prevailed throughout the State until near the close of the month. Severe frosts caused some damage to citrus fruits, and the continued cold and cloudy weather retarded the growth of grain and grass. Deciduous fruit trees were benefited by the cold, which checked premature budding. Early wheat was in good condition and early fruits were in blossom at the close of the month.—*Alexander G. McAide.*

Colorado.—Over a comparatively small area in the center of the State, in Lake, Summit, Eagle, and the northern part of Gunnison counties the total snowfall was considerably less than normal, but in general other parts of the mountain region appear to have had the normal amount or an excess. The bulk of the current fall has been swept into huge drifts in the timber, gulches, etc., where it is likely to remain hard packed and practically solid ice until after later snowfalls have melted.—*F. H. Brandenburg.*

Florida.—The month was warmer than the average, with an abnormal amount of precipitation, the latter having a very unfavorable bearing on the vegetable crop. Over portions of Dade County the losses were quite heavy, prospects being reduced one-half. The warm, cloudy weather was very favorable to citrus trees, which made a splendid growth. Early corn was pushing forward, and land is largely prepared for cotton. A small

acreage was planted to melons. The month was unfavorable to strawberries.—*A. J. Mitchell.*

Georgia.—The chief meteorological features of the month were the high mean temperature, the heavy rainfall in the northern and western sections, and the severe cold wave of the 16th to 18th. The temperature was characterized by three periods of unseasonably warm weather. From the afternoon of the 16th to the morning of the 17th the temperature fell 40° to 60°. The rainfall was the heaviest on record for February since 1892. The total monthly amounts exceeded 13 inches at several stations. Little or no farm work was accomplished. The cold wave of the 16th to 18th was especially injurious to peaches in the northern section, but in the middle and southern fruit belts the effects of the cold weather were less marked. Winter wheat and oats were in good condition.—*J. B. Marbury.*

Idaho.—The records for the month showed unusual deficiency in both temperature and precipitation; no greater extremes of cold were experienced than in previous years, but the cold was continuous throughout the month, the mean at many places being the lowest ever known; precipitation was mostly in the form of snow, slightly increasing the depth of snow at very high elevations, but not adding materially to the supply throughout the State; at the close of the month the snow was drifted considerably and well packed.—*E. L. Wells.*

Illinois.—The temperature was above the seasonal average the first half of the month; a period of cold weather of unusual severity prevailed from the 16th to the 20th; the precipitation was very unevenly distributed; a general and opportune snowstorm began on the night of the 14th, and it afforded ample protection to wheat during the ensuing cold wave. Wheat was in a promising condition at the end of the month. Fruit sustained injury from cold in the southern district.—*William G. Burns.*

Indiana.—Snow covered the ground in the north section throughout most of the winter and in the central and southern sections during the severe cold weather, affording good protection to wheat, and the crop at the end of February was unusually promising; rye, clover, and other grasses were also in fine condition; on account of the snow in the north section and rough or muddy fields in the central and southern sections considerable corn remained in the fields at the close of the month. Many correspondents in the southern section reported on the last of February that most if not all peach buds were dead.—*W. T. Blythe.*

Iowa.—Month generally favorable for stock and for farm operations usual in winter; fall wheat, rye, and grass were not materially affected by low temperature; at the close of the month snow had disappeared and the weather was spring like.—*John R. Sage.*

Kansas.—A cold month; the first and last days were warm and the middle portion cold. Wheat was well covered with snow during the cold part and was further benefited by the wet snow of the 24–27th, and was in good condition. Ground too wet for plowing or oat sowing in south. Some corn in field damaged by wet snow. Peach buds reported killed in central counties.—*T. B. Jennings.*

Kentucky.—Crops were fairly well protected by snow during the severe weather. In the western counties some damage was caused by floods. Early sown wheat was in excellent condition and the outlook for the crop as a whole was encouraging. Rye and oats were in good condition. Farm work was badly delayed; very little was done toward burning to-

bacco beds until the last of the month. Early peaches and early cherries have probably been injured by the freeze.—*H. B. Hersey.*

Louisiana.—General rains fell on fifteen days, and the ground was too wet for cultivation throughout the entire month. Preparations for cotton planting were much behind average seasons. Corn planting could not be commenced, and very little preparation for the crop has been made. Dry weather was needed for the sugar cane crop. Planting has been materially retarded, and much seed cane is sprouting in the windrows. Very little rice has been planted. Truck gardens where protected from the severe freeze during the second decade of the month were doing well, but where the warnings were not heeded the crops were killed.—*I. M. Cline.*

Maryland and Delaware.—Wet weather was somewhat hurtful to wheat in lowlands, but the crop as a whole was in a satisfactory condition, especially in the upper counties, where heavy snows on the 16th and 17th afforded ample protection during the cold that followed. Some peach buds were reported killed by the severe temperatures. All grasses were in fair to good condition. Some clover being seeded. Many tobacco raisers were seeding their beds. Farming operations generally have moved slowly on account of the frequent rainy spells.—*Oliver L. Fussig.*

Michigan.—Winter wheat was well protected from the 2d until the warm rains of the last few days of the month; it was especially well protected during the severe cold wave of the 16th to 19th. Correspondents generally agree that no injury occurred. At the close of the month most fields were bare; in many places low, level fields were covered with water, which might do damage if weather favorable for freezing and thawing ensued. The general opinion of correspondents was that all fruit trees had wintered well and were in a promising condition.—*C. F. Schneider.*

Minnesota.—Decidedly cold weather from the 12th to the 20th, with minimum temperatures below zero in all parts of the State, and below -40 in northern-central portions. The mean temperatures were slightly above the normal in the Red River Valley and in some other parts of the north, and it was cooler than usual in southern portions; the average for the whole State was slightly lower than the normal. There was less snowfall than usual; the snow depth averaged from 3 to 9 inches in the open country to much greater depths in the timber.—*T. S. Outram.*

Mississippi.—Heavy to excessive rains were quite general during the first 16 days of the month and during the last 3, while from the 16th to the 25th generally fair weather prevailed. The average precipitation for the State was by far the heaviest on record for the month. Conditions were unfavorable for preparing the soil for planting, and as a result little was accomplished along this line, except in some of the southern counties where oat seeding and truck gardening were in progress.—*W. S. Belden.*

Missouri.—Wheat was well protected by snow during the coldest weather except in a few of the northern and some of the extreme southern counties, and although it suffered some injury in localities from alternate thawing and freezing during the first part of the month, was generally reported in fair to good condition at the close. Practically all of the peach buds were killed by the low temperature of the 17th, except in a few of the extreme southern counties.—*A. E. Hackett.*

Montana.—The mean temperature for February was below the seasonal average in practically every part of the State, and the monthly range was unusually great. The range was covered with a sheet of crusted snow throughout the Milk River Valley to the east of Chinook, and in the Missouri River Valley in Dawson and Valley counties, and stock was suffering at the close of the month.—*Montrose W. Hayes.*

Nebraska.—The heavy snowfall of the month was very favorable to fall sown grain. The ground was covered with snow most of the time, protecting the grain from the low temperatures of the middle of the month, and the water from the melting snow will furnish sufficient moisture to place the ground in excellent condition to favor the growth of the grain when warm weather comes. Winter wheat continued in good condition. The ground being covered with snow has been unfavorable for stock interests in western counties, requiring an unusual amount of feed for the stock.—*G. A. Loveland.*

Nevada.—The weather throughout the month was unusually cold, with heavy snows on the 1st, 4th, and 8th. The valleys were covered with snow the first three weeks. In the mountain districts many sheep died from cold and starvation, the owners being unable to carry feed to them or drive them to the valleys on account of the deep snow.—*J. H. Smith.*

New England.—The month, though generally mild as to temperature, was considered stormy, with rapid and sudden weather changes. At the close of the month the ground in the southern portion was bare while in northern sections the depth of snow was less than the average for the season.—*J. W. Smith.*

New Jersey.—Winter grain and grass were well covered by heavy snow from the 16th to 26th. At the close of the month, although well protected during the severe cold spell, 17th to 23d, wheat and rye were below the average. Much young grass had been winter killed, and the fields looked very yellow. Orchard fruit trees have wintered well. The average depths of snowfall for the various districts were as follows: The Highlands and Kittatinny Valley, 8.6 inches; Red Sand Stone Plain, 10.8 inches; Southern Interior, 3.4 inches; Sea Coast, 4 inches. Some early peas were planted in the southern section.—*Edward W. McGunn.*

New Mexico.—Unusually cold February, with much more snow than usual, especially in northeastern and central sections. Some slight loss

in stock on northern ranges, but the beneficial effect of the heavy snows far outbalanced the loss. Soil was in excellent condition.—*R. M. Harding.*

New York.—The ground was reported bare in some sections during the first of the month, injuring wheat and rye to some extent, and some tops were brown, but very little damage was mentioned. During the latter part of the month there was ample snow protection, and wheat and rye were in good condition.—*R. G. Allen.*

North Carolina.—On account of the excessive rainfall very little farm work could be accomplished during February, and conditions were not favorable for the winter cereals. The warmth and moisture during the first half of the month caused succulent growth of wheat, which was considerably injured by the subsequent severe freeze from the 17th to 20th. At the close of the month the appearance of winter wheat, oats, and rye was not so good, though the excellent stands were unimpaired. Toward the end of the month trucking in the east made some progress and many tobacco beds were seeded.—*C. F. von Herrmann.*

North Dakota.—Some of the most severe cold weather for years prevailed during the month. The snowfall was less than usual in most sections.—*B. H. Bronson.*

Ohio.—Wheat was well protected by snow during the coldest weather, and received little if any injury from freezing and thawing; at the end of the month the plants were reported in good condition, but there was no snow on the ground. Stock was in good condition. No injury to peach buds was reported.—*J. Warren Smith.*

Oklahoma and Indian Territories.—Wheat was well protected by snow during cold period from 15th to 20th, and continues in good to fine condition; rye and volunteer oats were doing well. Stock was in fair condition, but suffered slight to serious loss during cold period. Fruit trees were uninjured. Farm work was delayed by wet, cold ground, and but small progress was made in seeding of oats and potatoes. The ground was full of moisture, and the outlook for crops was very promising.—*C. M. Strong.*

Oregon.—The month, although dry and sunshiny, was rather unfavorable for grain and forage plants; the nights were cold and frosty and the days were unusually warm. Early sown fall wheat maintained a good color and no complaint regarding the stand was made; winter seeded grain did not fare as well, especially that on low land, where the alternate freezing and thawing heaved the roots out of the soil, and some re-seeding will be necessary. There was a general shortage of pasture over the entire State at the close of the month.—*Edward A. Beals.*

Pennsylvania.—The mean temperature was higher than for any corresponding period since 1897 and the month was characterized by alternate and pronounced warm and cold spells. The average precipitation was the heaviest for any February since 1896; moderate amounts on the 1st to 4th, 8th and 9th, 11th and 12th; copious rains or heavy snow and sleet on the 15th, 16th, and 17th; heaviest rainfall of the winter on the 27th and 28th. Soil well protected by snow in most sections during the cold spell and so far as known grains and grass did not suffer by freezing.—*T. F. Townsend.*

Porto Rico.—The weather was ideal for cane cutting and sugar making, and this work was general; young canes needed more rain. Tobacco cutting progressed throughout the month and was nearly finished in some localities; this crop suffered from the dry weather and also from the tobacco flea. Coffee trees commenced to blossom during the last days of the month. Planting and cultivation of minor crops were retarded by the dry condition of the ground, especially in the southern and western districts. Pasturage was drying up and stock were suffering in consequence.—*E. C. Thompson.*

South Carolina.—The soil was too wet to permit much plowing or other farm work, which, in consequence, was backward. Fruit trees began to bloom early in the month in the southeastern portions, and buds were damaged by the freezing weather from the 17th to the 20th; truck was also injured slightly and growth checked. Wheat and oats continued promising. Seed beds for tobacco were prepared and seeded under unfavorable conditions.—*J. W. Bauer.*

South Dakota.—The temperature averaged below normal, with an unusually prolonged cold wave in the second decade. In the lower Missouri and several James Valley counties, the snowfall was considerably above the normal, but was deficient over most of the remainder of the State. Unmelted snow materially interfered with the grazing of live stock on large portions of the ranges, resulting in some losses and unusual consumption of stored feed. On the 28th, from 1 to 12 inches of snow covered the middle and eastern portions of the State.—*S. W. Glenn.*

Tennessee.—At the close of the month winter grains were in good condition generally, early sown wheat being well rooted and vigorous, with much better prospects than at this time last year; late sown was much damaged by cold from the 15th to 19th, but the snow on the ground from the 16th to 22d afforded some protection in places. Oats were badly winter killed. The rainfall was much above the average and the month was generally unfavorable for outdoor work.—*H. C. Bate.*

Texas.—Stormy, wintry weather characterized the month of February in all parts of the section. Marked fluctuations in temperature culminated in the severest cold wave of the winter from the 15th to 17th, which gave the first general freeze to all parts of the State and temperature below zero in the panhandle. Very heavy snowfalls in the panhandle and northwestern counties were recorded; at Amarillo the exces-

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest

and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings:

Summary of temperature and precipitation by sections, February, 1903.

Section.	Temperature—in degrees Fahrenheit.						Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.				Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.	Station.	Amount.	Station.	Amount.
Alabama	48.4	+1.4	Bermuda	83	14	Newburg	0	17	Goodwater	16.66	Ozark	3.23
Arizona	44.0	-5.8	Aztec	84	24	Ft. Defiance	-18	4	Cochise	4.20	Buckeye	0.00
Arkansas	41.0	-0.4	Paragould	79	3	Flagstaff	-12	17	Prescott	11.49	Silver Springs	3.15
California	43.7	-5.5	Imperial	94	23	Pocahontas, Pond	-36	13	Mount St. Helena	7.96	5 stations	0.00
Colorado	17.3	-9.0	Blaine	63	11	Lay	-45	15	Ruby	4.00	Delta	0.13
Florida	62.7	+3.7	Huntington	90	16	De Funiak Springs	20	18	Molino	12.69	Flamingo	1.35
Georgia	49.7	+2.6	Bartow	86	15	Diamond	9	18	Clayton	14.41	Statesboro	3.10
Idaho	19.2	-7.7	Douglas, Millen	58	22	Chesterfield	-37	14	Silver City	2.21	Blackfoot	0.00
Illinois	27.9	+0.9	St. Marys	68	2	3 stations	-19	17	Raum	5.22	Antioch	0.60
Indiana	29.8	+1.9	Cobden	67	3	Logansport	-17	17	Marengo	7.87	Topeka	1.25
Iowa	19.8	-0.2	Mattoon	56	2	3 stations	-21	16-18	Danville	3.25	Galva	0.30
Kansas	27.4	-2.6	Vevay	74	1	4 stations	-22	17, 18	Garden City	4.41	Hanover	0.52
Kentucky	37.5	+2.8	Eldora	75	13	Manchester	-16	19	Alpha	10.50	Scott	5.12
Louisiana	52.2	-0.5	Medicine Lodge	87	12	3 stations	9	15-17	Lake Providence	16.02	Oxford	5.10
Maryland and Delaware	35.5	+4.6	Jackson, Pikeville	73	25	Frederick, Md.	-12	18	Bachmans Valley, Md.	8.20	Chewsville, Md.	2.74
Michigan	21.0	+2.1	Oxford	87	12	3 stations	9	15-17	Wasepi	4.12	Humboldt	0.10
Minnesota	10.6	-1.0	Grape	53	2	Humboldt	-39	16	Willow River	2.56	St. Peter	T.
Mississippi	48.4	+0.1	New Uhm	47	22	Pokagonia Falls	59	16	Kosciusko	16.29	West Point	6.06
Missouri	29.8	0.0	Indianola, Laurel	80	13-15	Ripley	0	17	New Madrid	7.31	Grant City	0.53
Montana	17.7	-2.5	Caruthersville	74	2	Montreal	25	17	Red Lodge	1.61	2 stations	T.
Nebraska	19.2	-4.7	Lamedeer	60	22	Ridgeland	-45	16	Hayes Center	3.83	Fort Robinson	0.60
Nevada	20.7	-12.1	Ansley	60	27	Agate	-34	15	Lewers Ranch	1.63	2 stations	T.
New England	25.7	+2.6	Rioville	86	24	Wells	-32	13	Kingston, R. I.	7.04	Burlington, Vt.	1.92
New Jersey	33.7	+3.6	Berlin Mills, N. H.	63	28	Van Buren, Me.	-37	19	Woodbine	6.80	Layton	3.74
New Mexico	30.1	-5.9	Beverly	70	28	Ft. Union	-21	15	Mountainair	5.39	2 stations	T.
New York	26.0	+3.5	Carlsbad	79	1	Axon	22	18	Wappingers Falls	6.08	Haskinville	0.72
North Carolina	44.9	+2.2	West Berne	65	28	Linville	-3	18	Highlands	15.93	Carriuck Inlet	2.56
North Dakota	3.1	-3.5	Winnington	76	14	Dunseith	49	16	Fullerton	1.38	5 stations	T.
Ohio	29.9	+3.1	Ft. Yates	46	26	Milligan	-20	19	Waverly	7.75	Bucyrus	2.45
Oklahoma and Indian Territories	35.7	-2.1	3 stations	69	2	Kenton	17	16	Hartshorne	7.12	Newkirk	1.53
Oregon	34.1	-3.6	Goodwater	77	2	Pine	24	13	Glenora	8.50	Arlington	0.00
Pennsylvania	30.5	+2.8	Gardiner	71	28	Lawrenceville	-17	17	York	6.13	Warren	1.80
Porto Rico	74.5	-0.3	California	68	2	Towanda	18	18	Humacao	3.67	2 stations	T.
South Carolina	49.0	+3.0	Coatesville, Lebanon	68	28	Adjuntas	48	13	Clinton College	12.48	Charleston	2.07
South Dakota	12.0	-3.8	Manati	95	17	Barksdale	11	18	Yankton	2.58	Grand River School	0.01
Tennessee	41.4	+2.3	3 stations	81	14-16	Aberdeen	-39	17	Decatur	15.11	Center Point	3.87
Texas	47.3	-2.7	Cherry Creek	55	22	Rugby	-11	19	San Marcos	10.31	Fort Stockton	0.20
Utah	16.6	-12.7	Newport	76	15	Amarillo	-3	16	Frisco	1.66	2 stations	T.
Virginia	39.8	+3.8	Port Ringgold	89	13	Hefcefer	-29	14, 15	Speers Ferry	8.18	Cape Henry	2.46
Washington	32.7	-3.2	St. George	67	24	Lincoln	-13	18	South Bend	6.78	Pullman	T.
West Virginia	35.3	+4.3	Ilwaco	63	20	Ryan	-19	19	Chapel	9.59	Old Fields	2.58
Wisconsin	17.3	+0.8	Cuba	74	2	Grantsburg	-40	16	Appleton	2.27	Downing	0.05
Wyoming	13.5	-7.9	Prairie du Chien	57	12	Border	-51	14	Cheyenne	1.79	Irma	0.10
			Irma	56	19							

sive amount of 28.7 inches (unmelted) was reported. Farming operations practically suspended in many parts of the State, and little land breaking and seeding were accomplished. Winter grains continued to show excellent condition and only in low places was unsatisfactory growth reported, this being due to the water that covers the ground; the plants were well rooted and growing nicely; prospects were bright for fine grain yields. Extensive loss of plants and vegetables from severe freeze of the 15-17th, despite precautionary measures taken. Considerable loss of stock from the severe weather.—*Edward H. Bowie.*

Utah.—The month was not only the coldest February, but one of the coldest months on record for the State. Fields were generally well covered with snow throughout the month, and it was therefore not probable that any damage was done to fall grain by the low temperatures. The fruit crop was also thought to have passed through the month without damage. The small amount of feed which remained on the ranges was covered with snow, and reports indicated that a large number of cattle and sheep perished from starvation and exposure.—*L. H. Murdoch.*

Virginia.—The temperature of the month was above normal; the precipitation, nearly all of which came as rain, was in excess. On the whole, winter wheat and oats made satisfactory progress, though the wet condition of the soil caused some damage, and winter killing occurred, locally, during the coldest weather of the month. Some preparation of tobacco plant beds was made, though this and other outdoor work was hampered by unfavorable weather.—*Edward A. Evans.*

Washington.—Although the month was open, and there was an abundance of warm sunshine, winter wheat did not grow much on account of cold and frosty nights. Alternate thawing and freezing was thought by many to have caused some injury to wheat, but although it had not grown much it was in fairly good condition. Snow melted off before the end of the month, leaving the ground bare and wheat unprotected. Fruit buds were thought to be uninjured, although somewhat unduly developed.—*G. N. Salisbury.*

West Virginia.—Wheat, rye, oats, and grass were in better condition than usual at the close of February, being protected by a heavy snowfall from the severe freezing weather which prevailed from the 16th to the 23d. Plowing was generally backward, but had been begun in several southern counties, and a few tobacco beds were sown. Range stock suffered during the cold, snowy weather, but fed stock was in good condition. Rough feed was becoming scarce in some counties, but it will probably last through the winter. Peach buds which had swollen were probably killed.—*E. C. Vose.*

Wisconsin.—Conditions during the month generally favorable. Ample snowfall to afford protection to growing crops during the cold period from the 14th to the 24th, and sufficient precipitation, with the exception of small areas in the northern counties, to meet requirements of soil and winter grains and grasses. Special reports indicated generally satisfactory condition of winter crops. Precipitation somewhat below normal, but fairly well distributed.—*J. W. Shaeffer.*

Wyoming.—The month was a very unfavorable one for stock depending on range feed, owing to extreme cold and much of the range being covered with a crust of hard snow; the losses thus far have probably not exceeded the normal. The stock of snow in the mountains over the southern half of the State was such as to insure a good supply of water for irrigation next summer; the northern half of the State did not have as good a snowfall.—*W. S. Palmer.*

SNOWFALL AND WATER SUPPLY IN THE ROCKY MOUNTAIN REGION.

The following extracts are taken from the snow bulletins for February, 1903, prepared by the Section Directors of Climate and Crop sections in the Rocky Mountain region:

Arizona.—In the mountains snow lies on the ground to depths varying from one inch to several feet, giving promise of an adequate supply of

irrigation water for the coming crop season. Rain and melting snow during the winter have caused the soil in the regions which supply water for irrigation purposes to become generally well saturated with water, which increases the favorableness of the prospects. Springs in the mountain region are increasing in the amount of running water.

Colorado.—There has been a general and material improvement in the outlook for late irrigation. Over a comparatively small area in the center of the State, in Lake, Summit, Eagle, and the northern part of Gunnison, where the Gunnison, Grand, and Arkansas rise, the totals were considerably less than normal, but in general other parts of the mountain region appear to have had the normal amount or an excess. Exceptionally low temperatures have been a feature, and even on the sunny slopes there has been but little melting. The action of the winds will also be a factor in conserving the moisture, for the bulk of the current fall has been swept into huge drifts in the timber, gulches, etc., where it is likely to remain hard packed and practically solid ice until after later snowfalls have been melted.

Idaho.—February has contributed little to the supply of snow, the month having been deficient in precipitation over the entire State. However, while great extremes of cold have not been reached, the temperature has been uniformly lower than the average, so that while there has been a decrease in the depth of snow in the valleys the amount at higher elevations averages about the same as at the close of January. What little melting has taken place has only served to settle and pack the snow rather than to diminish its mass, so that in most sections the mountain gulches are well filled with hard, icy snow. In some sections high winds have formed drifts of great depths, which will further contribute to the uniformity of the waterflow.

Montana.—In numerous sections of Montana, especially to the west of the mountains, February was a cold month. The snowfall was deficient

over the greater portion of the State and general conditions have not changed materially since January 31. There is, however, a good supply of hard packed or solid snow that fell during the earlier part of the winter at the heads of most of the streams, and with few exceptions an ample supply of water would seem to be assured.

Nevada.—High winds drifted vast quantities of snow into the canyons and gulches where it is packed solid and in many localities nearly a hundred feet deep. The outlook for an abundance of water during the coming season is the best in many years.

New Mexico.—Reports from all sections of the Territory show that February brought more moisture than any February for many years past. The depth of snow lying on the ground at the end of the month ranged from 6 feet in the northern mountains to about a foot on the average in the Black Range country. The northeastern section of the Territory, which suffered so greatly from the protracted drought of last year, has had deep snows, covering all the plains to a depth of from 8 inches to 2 feet, and in the mountains of Union County to a great depth. Reports indicate that the snow is well packed in the ravines, thus insuring a steady supply. The streams are now carrying a good supply, and there is every prospect for an abundance of water for several months to come.

Utah.—The month was one of the coldest on record, and there was little or no loss of snow by melting. The snow continued to drift and pack nicely. As stated in the January bulletin, all sections of the State will have an abundant supply of water for irrigation throughout the whole of the coming crop season.

Wyoming.—Cold weather and a snowfall much in excess of the February normal was general over nearly every section of the State during the month.

SPECIAL CONTRIBUTIONS.

HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

GENERAL SUMMARY FOR FEBRUARY, 1903.

Honolulu.—Temperature mean for the month, 67.3°; normal, 70.6°; average daily maximum, 73.2°; average daily minimum, 61.3°; mean daily range, 11.9°; greatest daily range, 20.0°; least daily range, 6°; highest temperature, 77°; lowest, 53°. The month was colder than any month on record—25 years.

Barometer average, 30.003; normal, 29.958; highest, 30.21, 16th; lowest, 29.66, 19th; greatest 24-hour change, that is, from any given hour on one day to the same hour on the next, 0.30, 18-19th; lows passed this point on the 10th and 19th; highs on the 6th and 16th.

Relative humidity average, 71.4 per cent; normal, 76.0 per cent; mean dew-point, 57.0°; normal, 62.5°; mean absolute moisture, 5.24 grains per cubic foot; normal, 6.24 grains.

Dew-point lowest on record. Low periods indicating also passage of cold wave, 10th to 14th, and 23d. Dew on grass, 8 mornings.

Rainfall, 5.86 inches; normal, 5.48; rain-record days, 12; normal, 15; greatest rainfall in one day, 2.14, on the 20th; total at Luakaha, 7.98; normal, 14.07; at Kapiolani Park, 4.44; normal, 4.89.

The artesian well level rose during the month from 35.06 to 35.25 feet above mean sea level. February 28, 1902, it stood at 33.80. The average daily mean sea level for the month was 9.66, the assumed annual mean being 10.00 feet above datum. For February, 1902, it was 9.89.

Trade wind days, 17, (5 NNE.); normal, 12; average force of wind during daylight, 2.7, Beaufort scale. Average cloudiness, tenths of sky, 4.7; normal, 4.9.

Approximate percentages of district rainfall as compared with normal; South Hilo, 82 per cent; North Hilo, 130; Hamakua, 82; Kohala, 85; Waimea, 80; Kona, 65; Kau, 60; Puna, 80; Maui, 100; Oahu, Honolulu, 100; Upper Nuuanu and Koolau, 60; Kauai, 42.

The heaviest rainfall reported for the month was at Puuohua, Hilo, 19.36. Heaviest 24-hour rainfall, 4.86, at Laupahoehoe, 23d.

Ewa, 50 feet elevation, reports 51° minimum temperature on the 10th; Waimea and Waiakoa, 44° lowest temperature; Hilo, 54°.

Rainfall data for February, 1903.

Stations.	Elevation.	Amount.	Stations.	Elevation.	Amount.
HAWAII.			OAHU.		
Hilo, e. and ne.	Feet.	Inches.	Punahou (W. B.), sw.	47	5.86
Waiakoa	50	9.18	Kulaokahua (Castle), sw.	50	4.23
Hilo (town)	100	8.46	Makiki Reservoir	120	4.81
Kaunama	1,250	9.02	U. S. Naval Station, sw.	6	2.45
Pepeekeo	100	8.23	Kapiolani Park, sw.	10	4.44
Hakalau	200	10.17	College Hills	175	5.58
Honohina	300	13.21	Manoa (Woodlawn Dairy), c.	285	7.77
Puuohua	1,050	19.36	Manoa (Rhodes Gardens)	360	9.42
Laupahoehoe	500	11.95	School street (Bishop), sw.		
Ookala	400	10.98	Insane Asylum, sw.	30	5.08
HAMAKUA, ne.			Kamehameha School	75	
Kukui	250	8.13	Kalihi-Uka, sw.	485	7.77
Paaui	300	6.55	Nuuanu (W. W. Hall), sw.	50	5.18
Paaui	300	5.04	Nuuanu (Wyllie street)	250	
Honokaa (Mill)	425	5.24	Nuuanu (Elec. Station), sw.	405	5.23
Honokaa (Meinicke)	1,100		Nuuanu (Luakaha), c.	850	7.98
Kukuihaele	700	3.99	U. S. Experiment Station	350	5.69
KOHALA, n.			Laniakoa (Nahuia)	1,150	8.32
Niuli	200	3.53	Tantalus Heights	1,360	10.54
Kohala (Mission)	521	3.71	Waimanalo, ne.	300	2.84
Kohala (Sugar Co.)	270	3.35	Maunawili, ne.	300	5.02
Hawi, Mill	700	4.34	Kaneohe	100	3.63
Puakea Ranch	600	3.96	Ahuimanu, ne.	350	5.27
Puuhiue Ranch	1,847	4.75	Kahuku, n.	25	2.73
Waimea	2,720	3.68	Waialua	37	
KONA, w.			Wahiawa	900	
Holualoa	1,350	2.16	Ewa Plantation, s.	60	1.39
Kealahou	1,580	1.76	U. S. Magnetic Station	45	1.31
Napoopoo	25	1.85	Waipahu	200	1.59
Hoopulua	1,650		Moanalua	15	6.12
KAU, se.			KAUAI.		
Kahuku Ranch	1,680	1.94	Lihue (Grove Farm), e.	200	2.07
Honouapo	15	1.00	Lihue (Molokoa), e.	300	1.80
Naalehu	650	1.31	Lihue (Kukaua), e.	1,000	4.14
Hilea	310	2.20	Kealia, e.	15	1.29
Pahala	850		Kilauea, ne.	325	2.36
Moaula			Hanalei, n.	10	4.78
Volcano House	4,000		Waioli	10	4.67
PUNA, e.			Haena	15	4.56
Olaa, Mountain View (Russell)	1,690	10.57	Waiawa	32	0.86
Kapoho	110	2.28	Eleele	150	0.89
Pahoa	600	10.16	Wahiawa (Mountain)	3,000	7.60
MAUI.			McBryde (Residence)	850	3.24
Lahaina	40	3.58	Lawai (Gov. Road)	450	3.46
Waipae Ranch	700	1.99	Lawai, w.	225	2.08
Kaupo (Mokulau), s.	285	6.63	Lawai, e.	800	3.16
Kipahulu, s.	308		Koloa	100	2.76
Nahiku, ne.			Delayed January reports.		
Nahiku	1,600	17.80	Kaunama		4.08
Haiku, n.	700	6.88	Niuli		4.10
Kula (Erehwon), n.	4,500	5.94	Holualoa		3.17
Kula (Waiakoa), n.	2,700	3.50	Nahiku	1,600	25.40
Puuomalei, n.	1,400		Haleakala Ranch		14.21
Paia	180	7.32			
Haleakala Ranch	2,000	11.79			
Wailuku, ne.	250	5.58			

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.